Department of Defense
Legacy Resource Management Program

PROJECT 03-198

SPRNCA Water Needs Study
Info for Decision-Makers

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SPRNCA Water Needs Study
Info for Decision-Makers

Upper SanPedro Partnership

Background

USPP Planning Goal: **Ensure an adequate GW supply to meet the reasonable needs of both the area's residents and property owners (current & future) and the SPRNCA**

- **Detailed reports at: ftp://www-ftp.tucson.ars.ag.gov/rscott/**
- **SOW jointly developed with USPP**
- **To be integrated, reviewed and published as a USGS report**
- ***Intent:*** **Provide information and tools to policy and decision-makers regarding the hydrologic requirements of the SPRNCA and potential management actions that may be taken to reduce the consumptive water uses within the SPRNCA without resulting in any negative effects on riparian resources**

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Primary Objectives

- Determine the water needs of riparian vegetation, through the riparian growing season and throughout the SPRNCA to ensure its long-term ecological integrity
- Quantify the total water use of riparian vegetation within the SPRNCA
- Determine the source of water used by key riparian plant species within the SPRNCA

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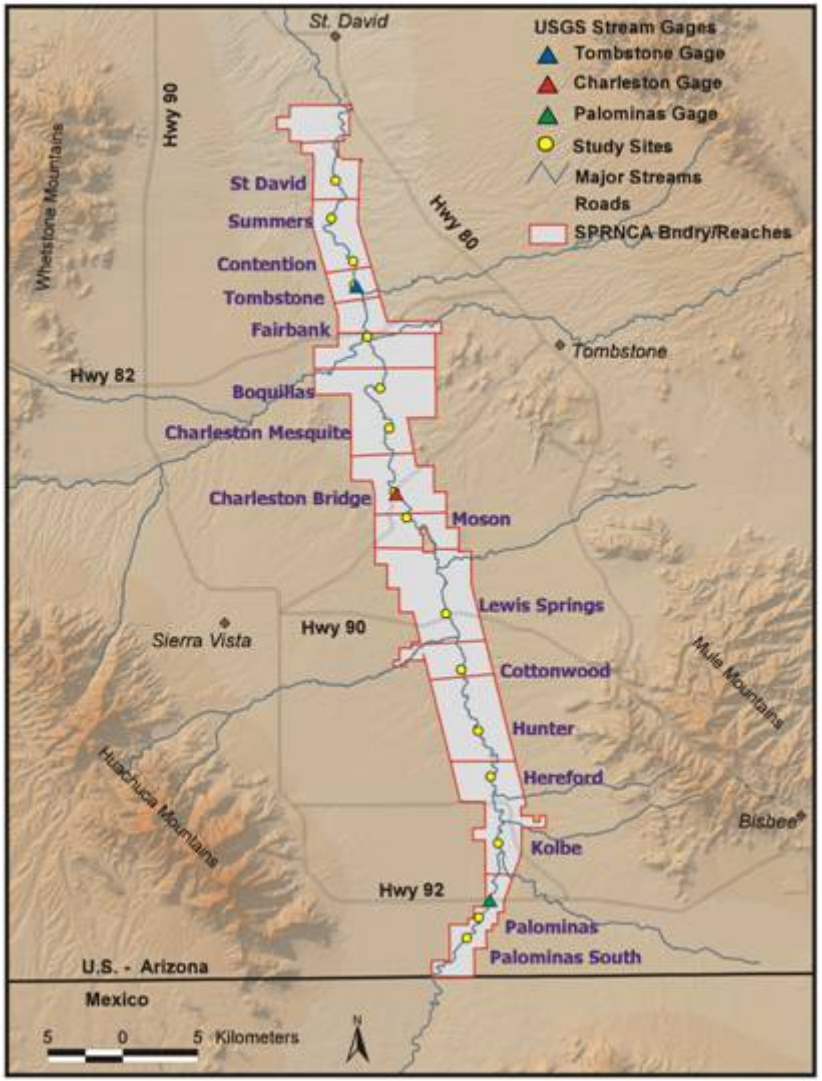
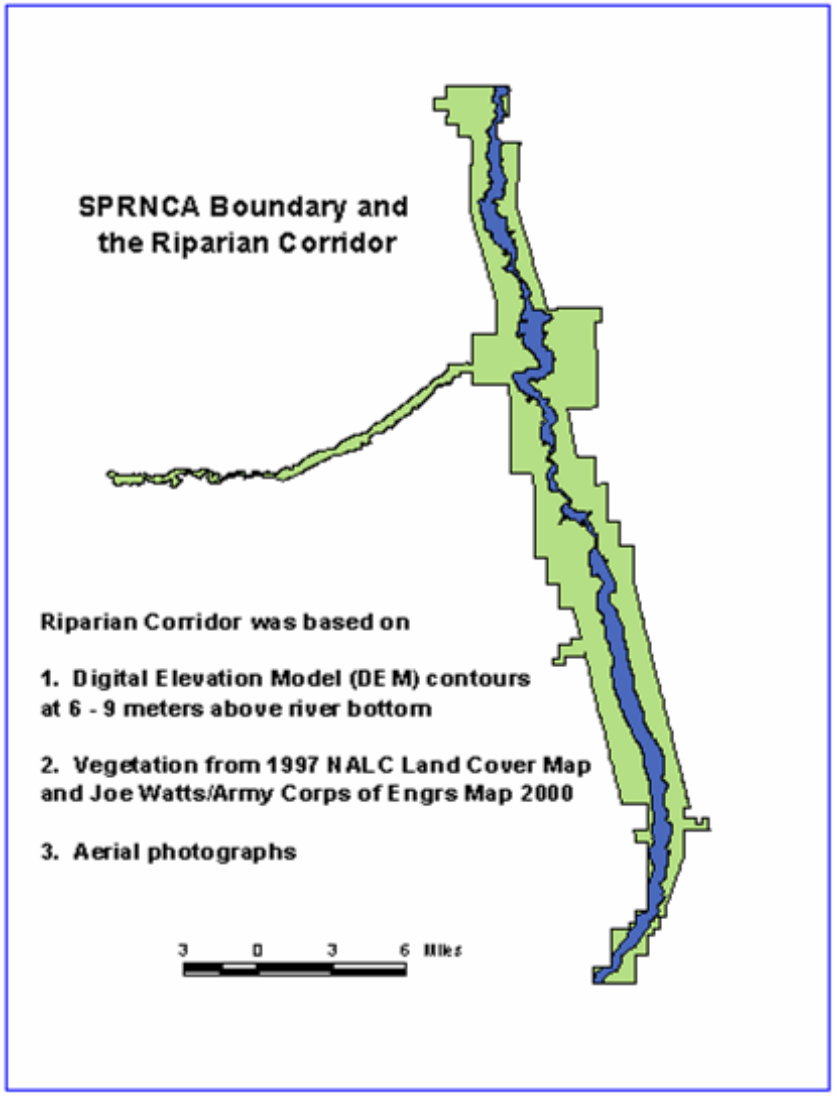
Hydrological Monitoring & Analyses





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Classification of reaches into condition classes

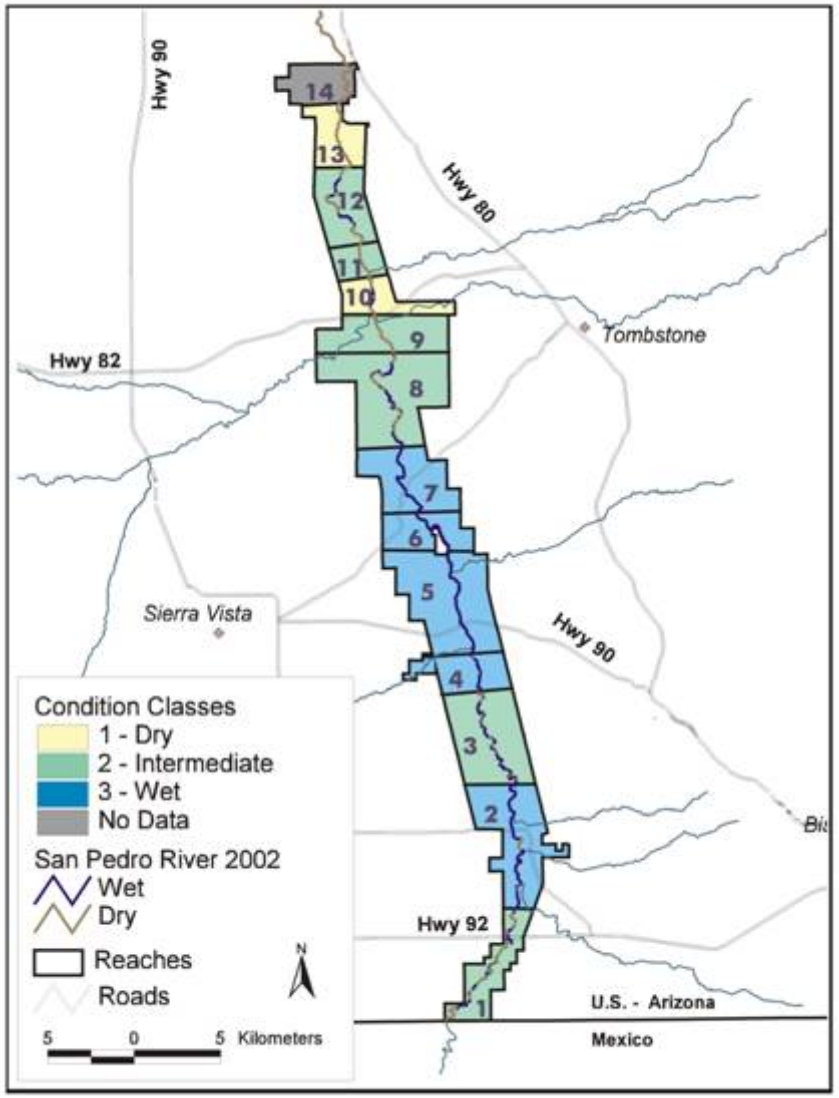
Vegetation assessment model

A model was developed that places sites into one of three condition classes, based on field collection of nine bioindicators (Veg. variables). Each biodindicator is sensitive to changes in SW or GW hydrology.

Each condition class is reflective of different levels of ecosystem functional capacity.

The assessment model can be used to track changes in the abundance of each condition class over time.

"State of the SPRNCA"



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Hydrologic Characteristics of each Condition Class

Cond. Class (CC)	Flow Permanence (1)	Dry Seasonal Max. Depth to GW (ft) (2)	GW Fluctuation (ft) (3)	Percent of SPRNCA (4)
1	Intermittent-Dry (< 60%)	Deep (> 11.5 ft)	Large (> 3.3 ft Diff. between monthly max and min)	9%
2	Intermittent-Wet (60% to 95%)	Moderately Shallow (8.2 - 11.5 ft)	Moderate (1.7 to 3.3 ft)	49%
3	Perennial (> 95%)	Shallow (< 8.2 ft)	Small - Stable (< 1.7 ft difference)	38%

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(1) 0% = no flow the entire year, 100% = surface flow entire year
(2) Dry-season mean as averaged across the floodplain
(3) As averaged across the floodplain
(4) 4% of the SPRNCA has not yet been adequately sampled

Condition Class 3 (wettest)

38% of SPRNCA

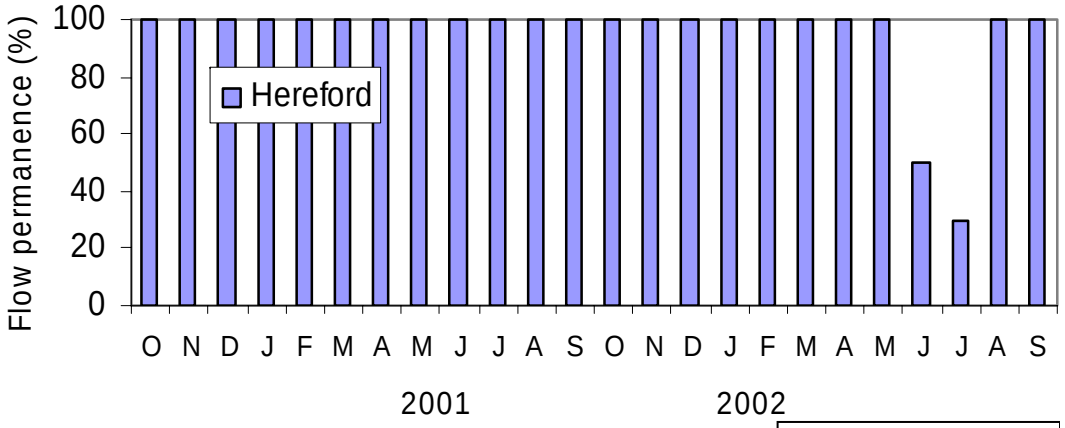
Perennial or near-perennial stream flow (present >95% of time)

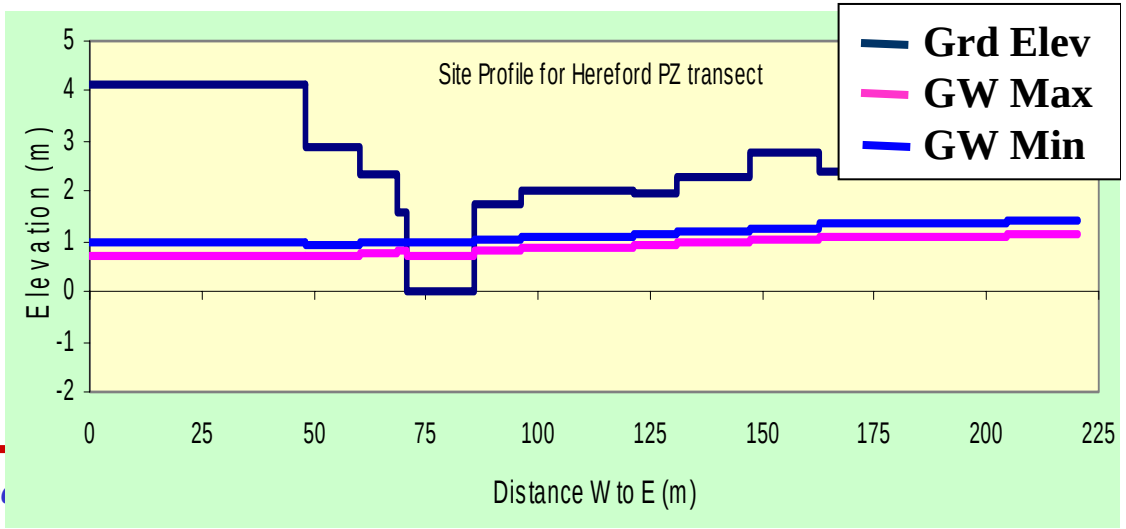
Shallow ground-water (mean depth of <2.5 m across floodplain during dry season) with little seasonal fluctuation (<0.5 m/yr)

Tall, dense, multi-aged cottonwood-willow forests

Tamarisk subdominant or absent

Channel lined by dense herbaceous cover





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Cond. Class 2 (intermediate)

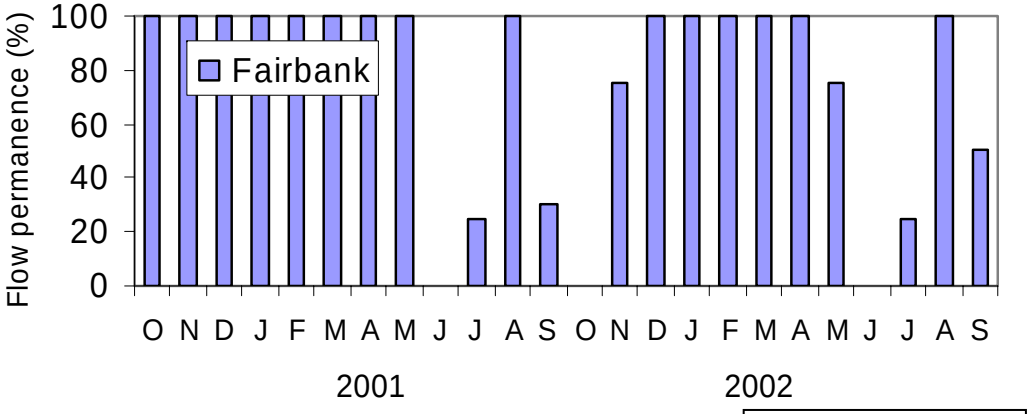
49% of SPRNCA

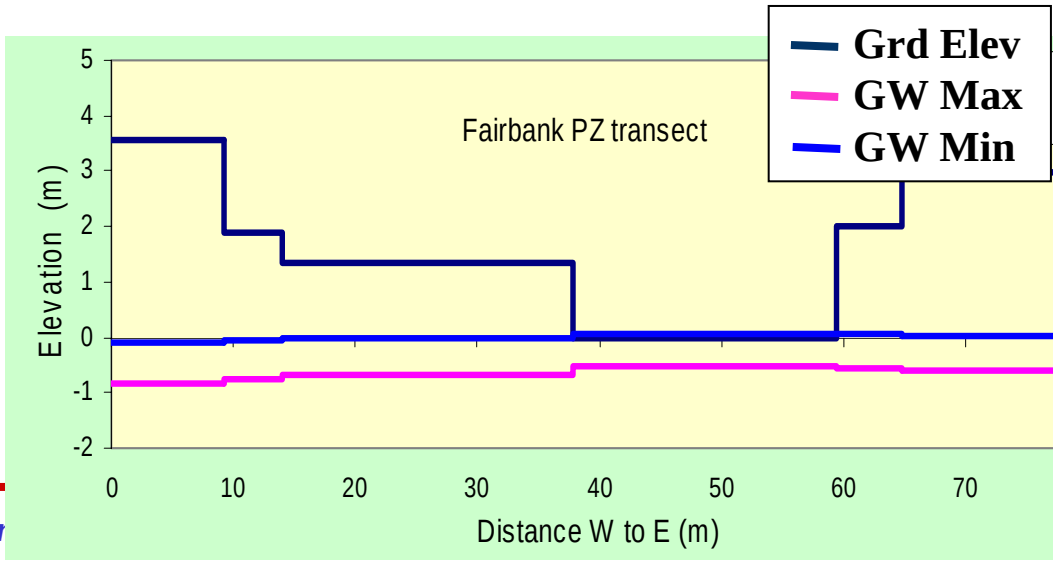
Stream flow present 60%-95% of time

Moderately deep and fluctuating ground water

Tamarisk has increased, although cottonwood-willow still dominant.

Streamside herbaceous cover is reduced, and mesic herb species have replaced hydric species.





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Condition Class 1 (driest)

9% of SPRNCA

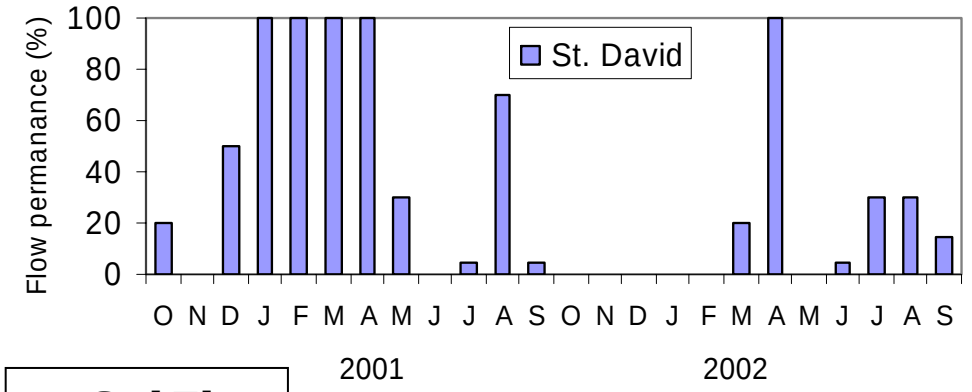
Stream flow present <60% of time

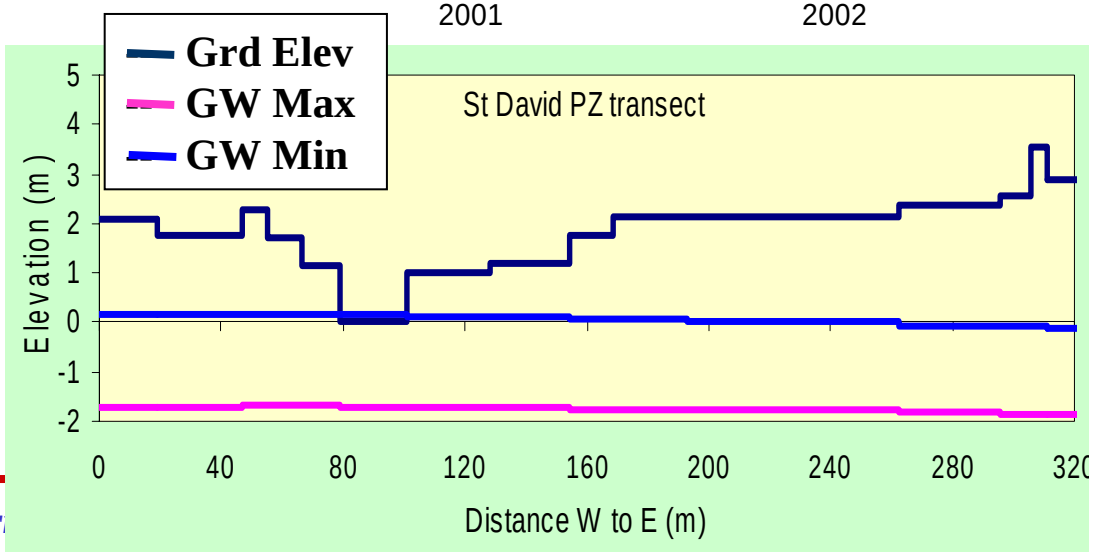
Deep (>3.5 m in dry season) and highly fluctuating (>1 m/yr) GW

Tamarisk dominant

Short shrublands with limited upper canopy cover

Sparse streamside herbaceous cover, dominated by mesic species such as bermuda grass





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2003 Riparian Water Use – SV Subwatershed

Water Use - Main stem from Intl. Border to Tombstone Gage for Riparian Corridor

Cover Type	Veg. Area (ac)	CU [acre-ft yr^{-1}]	2003 ET/unit area (ft)
Mesquite	1790-2400	4044-5443	2.3 *
Cottonwood/Willow (Perennial)	630	1981	3.2
Cottonwood/Willow (Intermittent)	290	389	1.3
Sacaton (< 3 m to groundwater)	280-410	486-718	1.7
Open Water	110	421	4.0
Salt Cedar	2.7 – 7.5	6-17	2.3
Total		**7328-8969**	
Corell et al. (1996)		7700 *	
Goodrich et al. (2000)		6590 **	

** * **Ranges due to classification procedure employed by the Army COE. All but Salt Cedar rounded to nearest 10 ac**

** ** **Using baseflow information from Palominas, Charleston, and Tombstone Gages**

Variability in Riparian Water Use and Climate

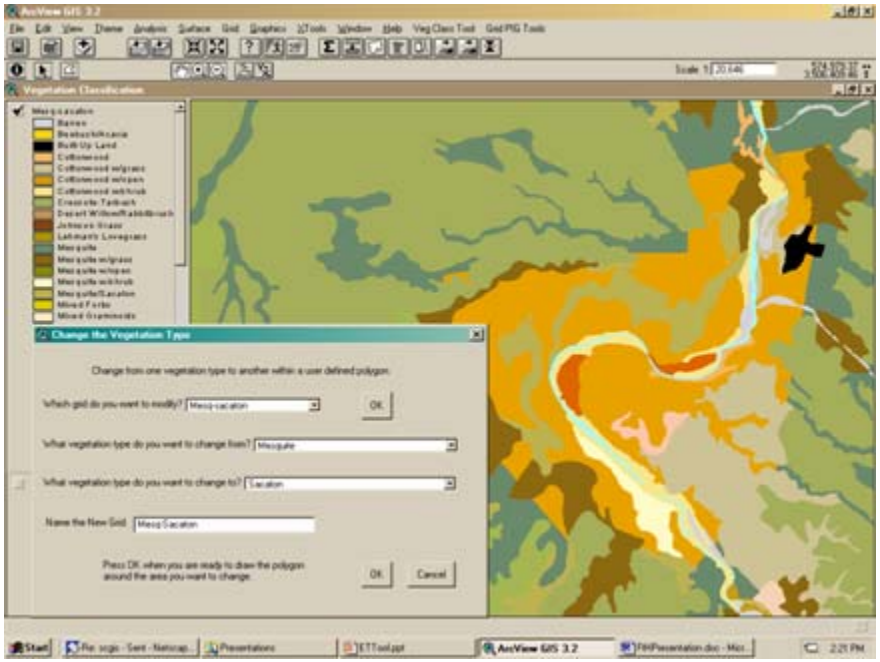
High interannual variability in climate will translate to a similar amount of variability in the riparian GW use

Mesquite Water Use Rates per Unit Area

2001	**2.2 ft/yr**
2002	**1.7 ft/yr**
2003	**2.3 ft/yr**

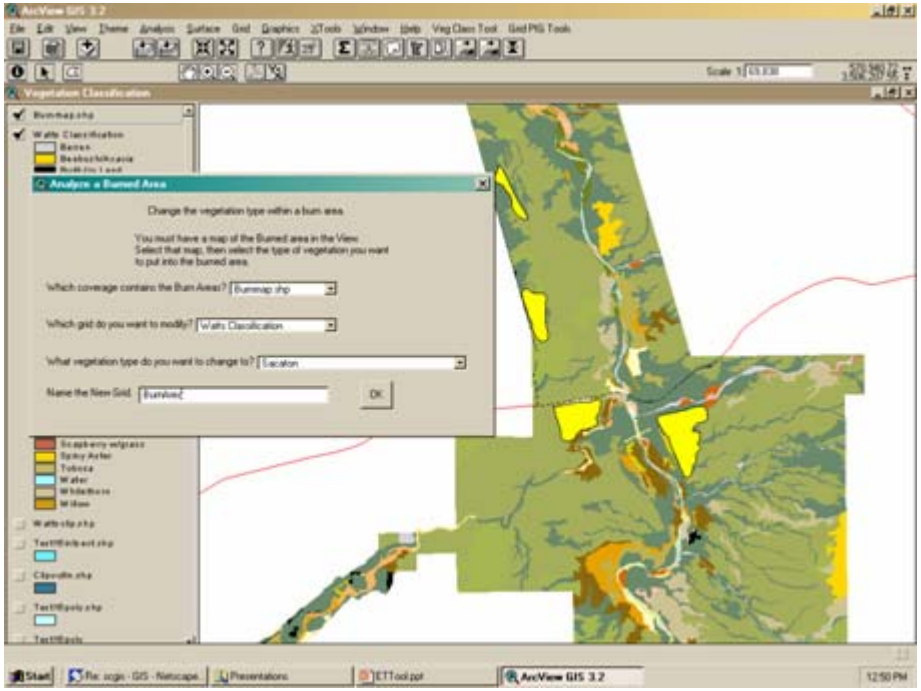
Large flow events (like October 2000) also impact the system's hydrology. This event maintained a higher level of flow permanence for 12 to 18 months following the October 2000 events.

GIS-based Veg. Management and Riparian ET Tool



Example:

Change all Mesquite in user-defined area to Sacaton (orange areas along the river)



Example:

Evaluate the effect of a prescribed burn with user-supplied polygon map of burn areas

Contact ARS to schedule a training session

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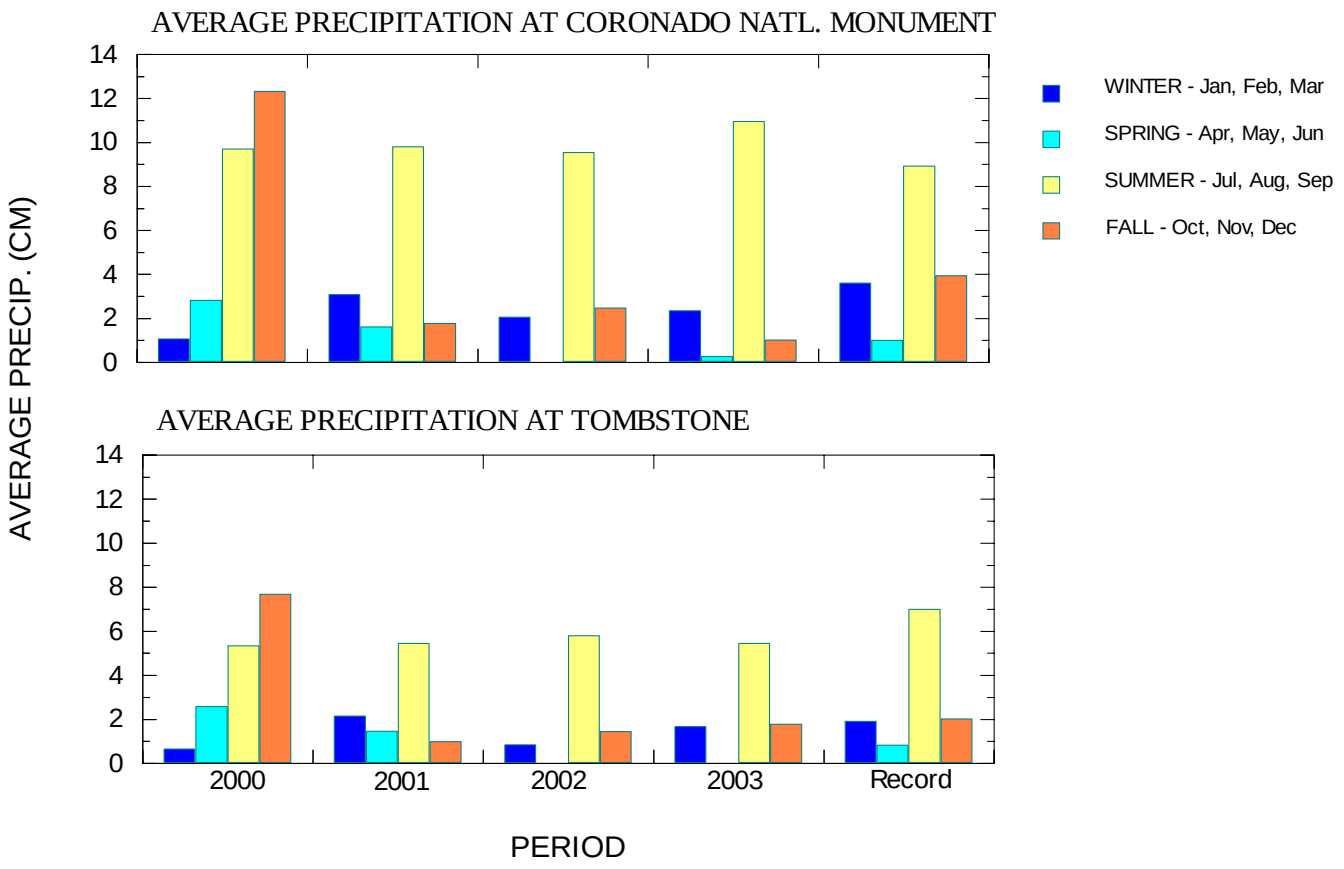
Study Period Conditions (Hydro-Climatic Context)

Charleston streamflow:

- **Lower than average in all seasons except Spring and Fall 2000.**
- **Streamflows generally decrease each study year.**

Precipitation:

- **Summers above average at Coronado**
- **Summers below average at Tombstone**



Major Hydro-climatic Conclusions

- **The magnitude of regional ground-water contribution to the stream alluvium and evapotranspiration control seasonal ground-water variability and streamflow permanence**

- **October 2000-sized floods play a significant role in maintaining water in the system for 12 to 18 months following the event**